affecting the earth's surface, and their results,—the rocks and strata formerly produced and subsequently altered, or worn away and reproduced, by similar agencies,—the meaning of fossils,—the successive groups of strata, or "formations," and their chief characters,—and, altogether, the history of the earth, deduced from the facts observable in it, as interpreted by the processes now in operation—these are the divisions of the subject-matter of this well written and conscientiously edited little book. Some of the latest information bearing on minerals, lithology, the Cambrian and Cretaceous systems, and the Glacial period have been concisely and carefully incorporated in this edition.

MISCELLANEOUS.

Anatomical and Morphological Researches on the Nervous System of Hymenopterous Insects. By M. Ed. Brandt.

The nervous system of the adult Hymenopterous insects is little known, still less that of their larvæ. There does not exist any investigation of the metamorphoses which the ganglionic chain undergoes in the passage from the larval state to that of the adult insect.

The nervous system of only eight species of Hymenoptera is known; these are *Bombus muscorum*, *Apis mellifica*, *Vespa crabro*, *Scolia hortorum*, *Formica ligniperda*, *Ichneumon atropos*, *Athalia centifoliæ*, and *Sirex gigas*.

Comparative and morphological researches are wanting. I have undertaken with this view a study of the nervous system of the Hymenoptera, by dissecting a number of species of the same group. I have thus determined the morphological character of the nervous system of each family. Having terminated my researches on the Hymenoptera, I have the honour of submitting to the Academy their principal results.

I have studied the nervous system of the adults in seventy-eight species belonging to all the families of Hymenoptera and to most of the genera, that of the larvæ in twenty-two species, and the metamorphoses of the chain of ganglia in fifteen species.

I. *The Nervous System of the Adult Hymenoptera.*—There are two cephalic ganglia (a supraœsophageal and a subœsophageal ganglion), two or three thoracic and from three to seven abdominal ganglia. The Apides and the Wasps (*Vespa*, *Odynerus*, *Eumenes*), as well as the *Crabrones* (*Ectennius* and *Thyreopus*) and *Chrysis* have two thoracic ganglia, while *Cerceris*, *Ammophila*, *Pompilus*, *Formica*, *Mutilla*, *Myrmosa*, the Entomospheces and the Phytospheces (*Cimbex*, *Tenthredo*, *Sirex*) have three thoracic ganglia. In the Hymenopterous insects with two thoracic ganglia the second always presents, in its middle, a more or less distinct emargination, an indication of the fusion of two ganglia. Sometimes the indentation is very marked and the ganglion becomes double (*Odynerus*).

In each form of the nervous system there is a different number of abdominal ganglia (three to seven), while the larvæ have eight abdominal ganglia (except the larvæ of the Pteromalidæ, which have no chain of ganglia, but a simple and compact nervous mass as in the larvæ of the flies). During the pupa stage the number of ganglia diminishes in the different species, many of them approaching one another and becoming fused. The *supraœsophageal ganglia* are very strongly developed and completely cover the small *subœsophageal* ganglion, which is united to them by very short commissures. The examination of the pedunculate bodies has shown me a very singular peculiarity which has not previously been observed. F. Dujardin remarked that the development of these bodies corresponds with the degree of development of the instincts and intelligence in the *different species*; my researches prove that this is also the case for the *different sexes of the same species*. Thus in the workers of the common bee they are of immense size, while they are slightly developed in the queen and in the males: this is the case also in the wasps and the ants. The pedunculated bodies do not emit ocellar nerves as F. Dujardin has asserted; these latter emerge from the upper part of the supraœsophageal ganglia.

The subœsophageal ganglion is very small, formed of a pair of nuclei, and gives origin to three pairs of buccal nerves. Where the nervous system has three thoracic ganglia, the *first* and the *second* are simple, and have only two nuclei, while the third is always more or less composite. In the Phytospheces there are two pairs of nuclei, and in the Entomospheces, as well as in *Cerceris*, *Pompilus*, *Ammophila*, and *Formica*, three pairs. It is evident that in the first case the last thoracic ganglion results from a fusion of two, and in the latter case of three ganglia of the larva. In the Hymenoptera which have only two thoracic ganglia (bees and wasps), the second presents four pairs of nuclei, resulting from a fusion of four ganglia of the larva (the last two thoracic and the first two abdominal ganglia). The number of abdominal ganglia varies from three to seven. Hitherto it has been thought that only the last abdominal ganglion is composite, while the others are simple; but I demonstrate that, in many cases, it is the penultimate abdominal ganglion which is composite (the worker bee, the female of *Mutilla europæa*), while the last is simple. The largest number of abdominal ganglia (that is to say, seven) exists in the lower representatives of the order Hymenoptera, the Phytospheces, in which all these ganglia are simple as in the larvæ. Most of the Entomospheces (*Ammophila*, *Cerceris*, *Odynerus*, and *Bombus*) have six simple abdominal ganglia. If there are only five abdominal ganglia, two different forms are found: it is either the last abdominal ganglion (*Andrena* and the worker of the wasp) or the penultimate ganglion which is composite (the worker of the bee). Where there are only four abdominal ganglia, it is usually the last that is composite. In the *Eucerata* and *Crabrones* (*Ectennius*, *Thyreopus*, &c.), having only three abdominal ganglia, the last, which is always very large, is produced by the fusion of the last four ganglia of the larva.

Another very remarkable fact, which has not previously been observed, is a difference *in the number of ganglia in the same species according to the sex*. The workers and the females of *Bombus* have six abdominal ganglia, while the male has only five; the working bees have five abdominal ganglia, while the queen and the males have but four; the male *Megachile* has four abdominal ganglia, while the female has five; the working wasps have five ganglia, the females and the males six.

The stomato-gastric system is composed of a frontal ganglion, two angeian ganglia, two tracheau ganglia, and a ventricular ganglion.

II. *Nervous System of the Larvæ.*—The nervous system of the larvæ is very uniform. The larvæ have thirteen ganglia, while the caterpillar of the Lepidoptera has only twelve. The larvæ of the Hymenoptera have eight abdominal ganglia, which are all simple; in very young larvæ, however, the subœsophageal and the last abdominal ganglia show traces of the fusion of three embryonic ganglia.

III. *Nervous System of the Embryo.*—The researches of O. Rietschli and of A. Kowalewski on the development of the bee have proved that the embryos possess seventeen ganglia—that is to say, one *supra-œsophageal ganglion*, three small *subœsophageal ganglia* (which unite to form a single subœsophageal ganglion in the larva), three *thoracic* and ten *abdominal ganglia* (of which the last three form afterwards the last abdominal ganglion of the larva).

IV. *Metamorphoses of the Nervous System.*—The changes which the nervous system undergoes during the metamorphoses of the larva are produced by the fusion of several ganglia. The first thoracic ganglion of the larva remains isolated in the adult insect; the second and third thoracic ganglia of the larva approach one another more or less, and in some they blend into one medullary mass. The first abdominal ganglion always joins with the last thoracic, so that the adult insect has never more than seven abdominal ganglia; but in most cases the second abdominal ganglion also unites with the last thoracic ganglion. If the number of abdominal ganglia diminishes yet more in the adult insect (5, 4, 3 ganglia), this is effected by the fusion of some ganglia with the last abdominal ganglion.—*Comptes Rendus*, Sept. 18, 1876, p. 613.

On some remarkable Species of Mantidæ. By Prof. J. Wood-Mason.

These insects belong to that division of the family in which either the legs or some parts of the body are provided with appendages, and to that section of it in which in males as well as in females the antennæ are simple and setaceous and not pectinated; and I invite attention to some sexual differences presented by them which, I believe, have never before been noticed.

In *Hestias Brunneriana* the head of the female is prolonged vertically in the form of a cone bilobed at its extremity, while in the opposite sex this great cone is represented by a mere tubercle as in both sexes of the species belonging to the genus *Creobrota*; the fore femora, which are wanting in the specimen from which the species was described by Saussure, are equally conspicuous in both sexes, being very broadly oval, with their upper margins very strongly crested.